



Explanatory Guide to the NASA Office of Space Science Education & Public Outreach Evaluation Criteria

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The most current version of this document can be downloaded by linking through “*Education*” from the NASA Office of Space Science home page, <http://spacescience.nasa.gov/>

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Preface

The NASA Office of Space Science (OSS) has recognized the unique inspirational assets of the Space Science community to powerfully and positively impact the nation's present and future K-14 science education and public outreach (E/PO) needs. In 1995-1996 the Office of Space Science developed and implemented a strategic plan to more effectively engage and involve the space science community in support of the nation's future interests and needs in science education. The OSS E/PO Strategy and E/PO Implementation Plan (see Appendix A for links to these and other pertinent NASA Web resources) both call for education and public outreach to become an integral part of the space science community's professional activities. They also call for the policies, funding, and infrastructure necessary to facilitate opportunities for the space science community to become more deliberately and effectively engaged in E/PO.

In 2002, NASA released its current Mission Statement,

To understand and protect our home planet,

To explore the Universe and search for life, and

To inspire the next generation of explorers,

.....As only NASA can.

The mission "To inspire the next generation of explorers" specifically highlighted the importance of education within NASA and led to the creation of a NASA Office of Education which is responsible for an enhanced and coordinated Agency-level education program to which the OSS program is a major contributor.

The Guide begins with the Evaluation Criteria for the E/PO segments of R&D proposals. The criteria used in previous versions of this guide have been reorganized and expanded to align with the Office of Education "Exemplary Program Criteria" and the *Guidebook for Proposers Responding to NASA Research Announcements* which is available at <http://www.hq.nasa.gov/office/procurement/nraguidebook/>.

The Evaluation Criteria are intended to guide investigators in aligning their proposed efforts with the goals and objectives of the OSS E/PO strategy and implementation plans. These criteria also serve as the basis for judging the quality of proposed E/PO segments. It is vital that everyone concerned (i.e., proposers, E/PO partners and facilitators, reviewers) have a common understanding of what these criteria mean in practice. This Explanatory Guide to the OSS E/PO

Evaluation Criteria is intended to support the development of such a common understanding. The Guide then provides a brief elaboration of each of the OSS E/PO Evaluation Criteria. These descriptions include references to pertinent information in the next section of the Guide that addresses Frequently Asked Questions (FAQ), and they also include "Indicators" that may be used by both proposers and reviewers to assess how well an E/PO proposal segment meets the Evaluation Criteria.

The next segment of the Guide provides answers to questions frequently asked (FAQ) by members of the space science community who are preparing an E/PO segment to an OSS proposal. Since the previous Guide update in 2002, several FAQs have been added or revised to address current policy, incorporate best practices, and provide more information in support of proposal preparation and understanding the intention of the Evaluation Criteria.

The information contained in this document is intended to give a flavor of what exemplary E/PO can be rather than a prescription for what to do. It is based on experience to date and thus the contents of the Guide will evolve over time with regular updates. For the latest version, please link through *Education* at the NASA OSS Web site

<http://spacescience.nasa.gov/>

If you have comments or questions, please send E-mail to Dr. Larry Cooper (Larry.P.Cooper@nasa.gov).

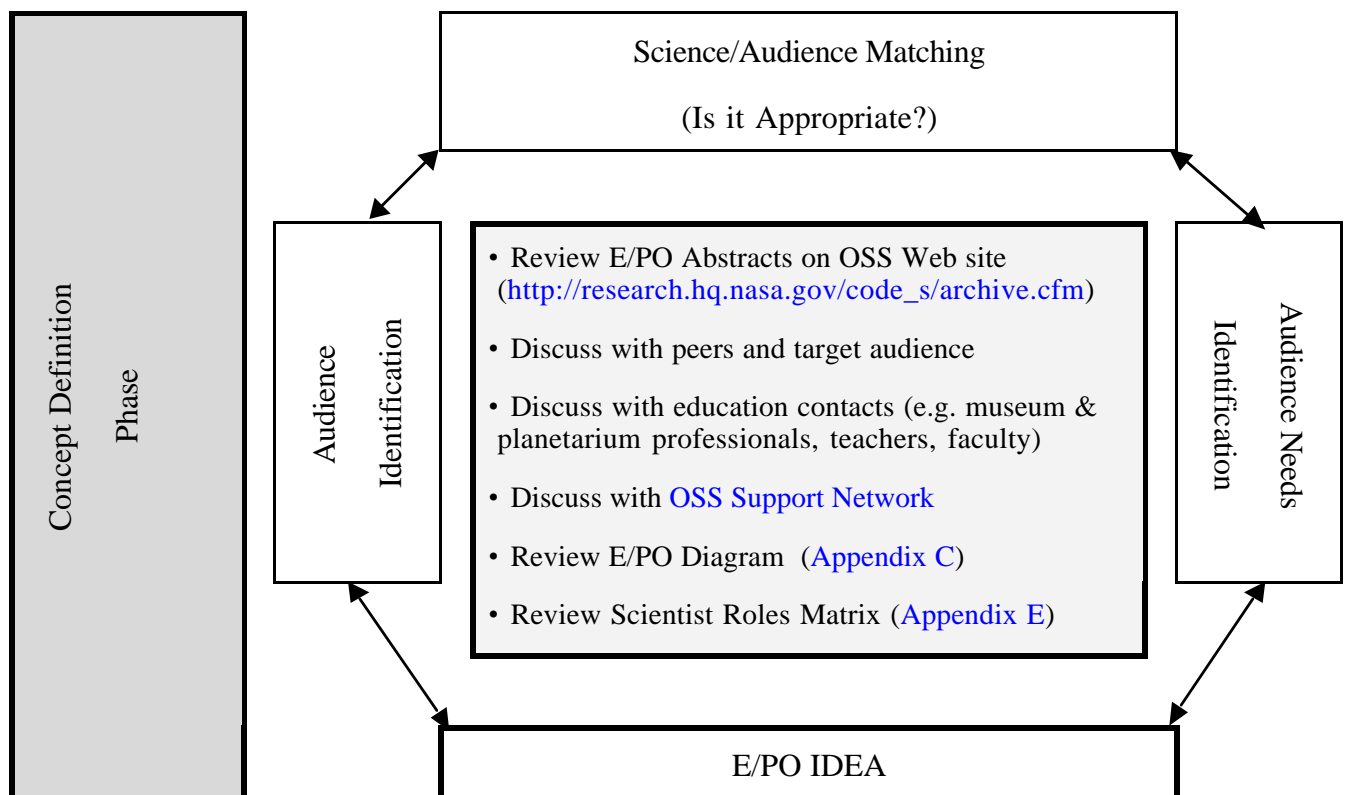
Office of Space Science Education And Public Outreach Proposals Quick Start Help

Developing an Office of Space Science (OSS) Education And Public Outreach (E/PO) proposal for the first time is a significant undertaking for a scientist. You'll be helping to inspire the "Next Generation of space explorers. Getting started in E/PO is fairly straight forward – you need an E/PO idea that the OSS E/PO program can fund, you need a team of people with the expertise to carry the idea out, and you need to write it all down in a concise proposal.

OSS recognizes that you are probably not an expert in education and public outreach and has prepared this Explanatory Guide to help you understand what OSS is looking for in a proposal, suggest roles and ideas that you might consider, resources you can consult, and provided a network of people (the Support Net – see FAQ (6, 7, 8) around the country to assist you.

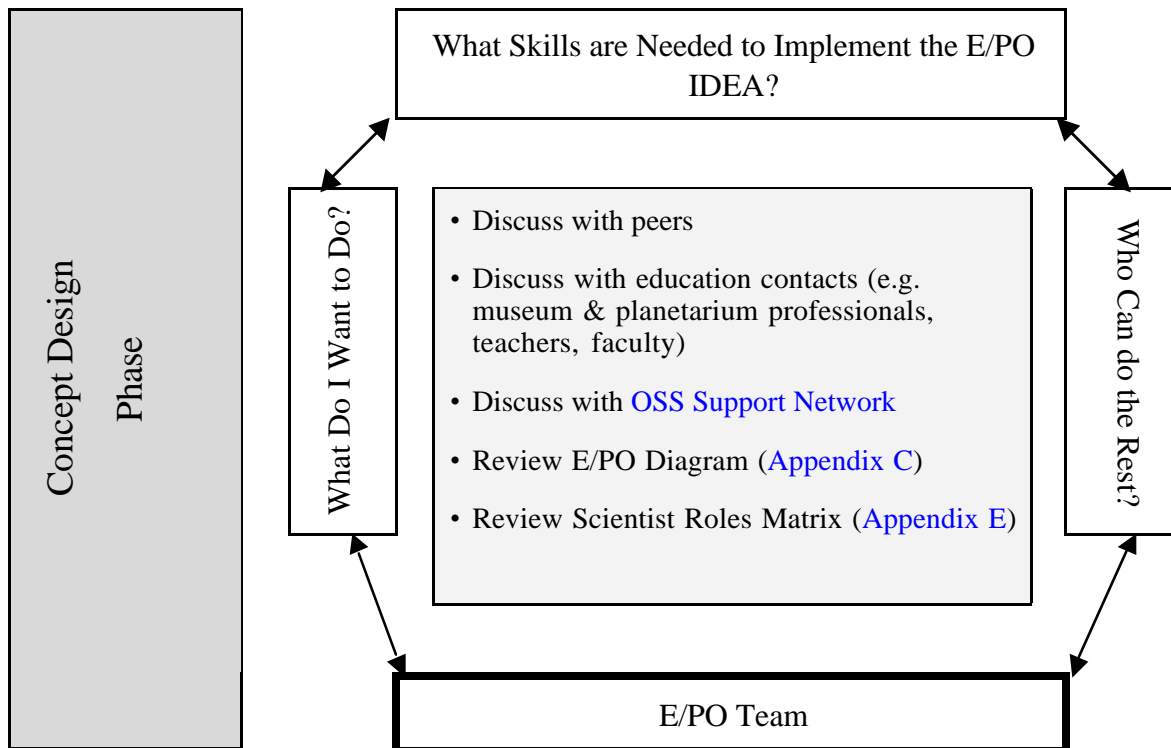
Step 1: Review the [OSS E/PO Evaluation Criteria](#) (Section 1 of Guide). Understand what types of E/PO ideas can be funded with the OSS E/PO program.

Step 2: Generate an E/PO IDEA—this is usually an iterative process of identifying potential audiences and their needs and matching them against the science you are doing.



Step 3: Review the OSS E/PO [Indicators of Alignment](#) (Section 2 of Guide) and [FAQs](#). Understand the details of OSS E/PO programs and what the review panel will be looking for.

Step 4: Put Together Your E/PO Team—this is usually an iterative process to evaluate the skills needed for the project and then to identify who has them. Budget considerations can come into play.

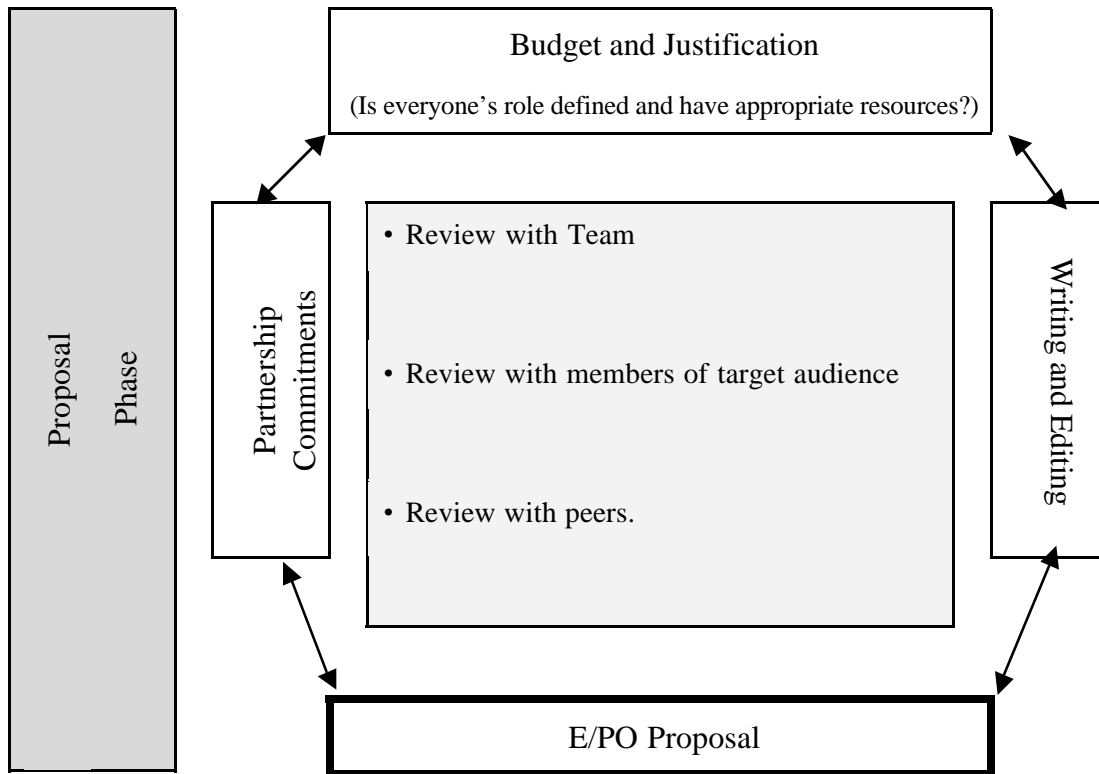


Don't overlook program evaluation—Evaluation should be geared to the scale and type of a proposed E/PO effort. Smaller E/PO programs, such as those responding to an NRA, might use simple, informal, or very specific evaluation methods like pre- and post-tests, questionnaires, or a focus group. The person doing the evaluation should be knowledgeable in the use of the selected evaluation approach. Support Network members can assist in identifying potential reviews.

The Space Telescope Science Institute IDEAS program provides an excellent primer on evaluation that is relevant to NASA OSS E/PO programs. The URL is:
<http://ideas.stsci.edu/Evaluation.shtml>

Step 5: “Sanity Check” – discuss your E/PO Idea and Partners with a representative of the target audience and/or the [OSS Support Network](#).

Step 6: Prepare Your Proposal—this is usually an iterative process between the team members. Reviews by the target audience can help clarify goals and objectives. They can also help ensure that sufficient detail is provided for reviewers who may be unfamiliar with the science or particular approach to implementing the E/PO program.



Step 7: The Review Process

To ensure quality and consistency in the review process, review panels for the E/PO segment include both educators and scientists.

The process of handling E/PO proposal segments follows the known best and fair practices for proposal review in current use throughout OSS. (See the *Guidebook for Proposers Responding to NASA Research Announcements*, Appendix C, which is available at <http://www.hq.nasa.gov/office/procurement/nraguidebook/>.)

The panel reviews are conveyed to proposers along with the funding decision.

E/PO programs proposed to the Office of Space Science are required to make a valuable contribution to K-14 education, and/or public outreach to enhance public understanding of science, and/or the enhanced participation of underserved/underutilized groups and women in science that is consistent with Office of Space Science education and public outreach goals and objectives.

The financial scope of E/PO segments submitted in response to Announcements of Opportunity (AO) will be significantly greater than that of NASA Research Announcements (NRA). Because of the limited financial scope of NRA programs, a sound, well-posed, and focused effort that will clearly be effective in reaching its intended target audience is preferable to an unrealistically broad effort.

OSS E/PO Evaluation Criteria

The principal elements considered in evaluating an E/PO proposal are its intrinsic merit, relevance to NASA's objectives, and its cost. **The failure of a proposal to be rated highly in any one of these elements is sufficient cause for the E/PO proposal to be declined.** [Intrinsic Merit and Relevance are equally weighted and approximately twice that of Cost.]

Sub-factors indicate areas of evaluation where strengths and weaknesses will be identified. The collection of strengths/weaknesses under each principal element will determine the rating for that principal element.

Intrinsic Merit

1. Quality, Scope, Realism, and Appropriateness—Programs have a clear intellectual linkage to the science and/or science theme of the parent research proposal, are clearly organized, consistent with the requested budget, have clear lines of management responsibilities, and demonstrate a high probability for successful implementation.

2. Customer Needs Focus—Programs have been designed to respond to a need identified by the education community, a customer, or a customer group.

3. Partnerships/Leverage/Sustainability—Programs achieve high leverage and/or sustainability through intrinsic design or the involvement of appropriate local, regional, and/or national partners in their design, development, and dissemination.

Active involvement of appropriate and qualified partners and members of the science team is required for Office of Space Science E/PO programs.

4. Evaluation—The appropriateness of an evaluation plan to document outcomes and demonstrate progress toward achieving objectives of proposed education/outreach activities, commensurate with the scale of the E/PO program.

Relevance to NASA’s Objectives

5. Content—Programs make direct use of NASA content, people or facilities to involve educators, students, and/or the public in NASA science, technology, engineering, and mathematics.

Proposals that focus on formal education must demonstrate alignment with appropriate educational standards.

6. Pipeline—Through the use of NASA space science, programs/products make a demonstrable contribution to attracting diverse populations to careers in science, technology, engineering, and mathematics (STEM).

7. Diversity—Through the use of NASA space science , programs reach identified targeted groups. They contribute to the involvement, broad understanding, and/or training of underserved and/or underutilized groups in science and technology.

Cost

8. Resource Utilization—The adequacy, appropriateness, and realism of the proposed budget including demonstration of effective use of funds.

Indicators of Alignment with the OSS E/PO Evaluation Criteria

To aid proposers in the preparation of their proposals, as well as to ensure that reviews are carried out on a consistent basis aligned with the NASA Education Strategy and OSS Implementation, this section offers further elaboration of each of the E/PO Evaluation Criteria. Note that although creativity and innovation are certainly encouraged where appropriate, the criteria do not focus on the originality of the proposed effort. This is a fundamental departure from standard scientific review criteria and allows space scientists to become actively involved in the kinds of E/PO activities that have already proven to be meaningful, effective, and credible.

INTRINSIC MERIT

1. Quality, Scope, Realism, and Appropriateness—Programs have a clear intellectual linkage to the science and/or science theme of the parent research proposal, are clearly organized, consistent with the requested budget, have clear lines of management responsibilities, and demonstrate a high probability for successful implementation. Alignment Indicators include:

- Program objectives are clearly and succinctly described. Program activities clearly flow from the goals and objectives.
- There is a clear intellectual linkage between the E/PO program (objectives and proposed activities) and the science objectives of the parent research proposal. (see [FAQ 9](#))
- Essential information about each proposed E/PO activity and product is provided (e.g., who, what, when, where, why, how).
- E/PO program implementation is feasible for the specified intended audiences.
- The E/PO program management is clearly defined with clear lines of authority. Areas of responsibility are defined and specified. All key personnel (including the E/PO lead for AOs) are identified and have institutional authorization ([FAQ 22, 24](#)) to participate.
 - One or more science team members are directly involved in overseeing the proposed E/PO program (see [FAQ 20](#)).
 - One or more science team members are directly involved in meaningful and appropriate E/PO roles in addition to oversight (see [Appendix E](#)).
- There is a schedule and/or timeline for proposed E/PO activities or some indication of how E/PO activities will be phased with the proposed research program and/or appropriate mission milestones (in the case of AOs) that is clearly aligned to the budget request.

2. Customer Needs Focus–Programs have been designed to respond to a need identified by the education community, a customer, or a customer group.

Alignment Indicators are:

- The program is based on a clearly expressed, compelling mutual need between NASA and the audience.
- NASA funded researchers can make an effective content contribution.
- Participants will find the program valuable.
- The program is accessible to its intended audience.

3. Partnerships/Leverage/Sustainability–Programs achieve high leverage and/or sustainability through intrinsic design or the involvement of appropriate local, regional, and/or national partners in their design, development, and dissemination.

Active involvement of members of the science team and appropriate and qualified partners is required for Office of Space Science E/PO programs.

Indicators of committed, qualified, and capable partnerships include:

- There are well-defined roles and specific tasks that are substantively related to the design, development, dissemination, implementation, or evaluation of E/PO activities and/or products for the E/PO partners and members of the space science community that are sufficient to ensure successful program implementation (see [FAQ 20, 21](#)).
- E/PO partners are specifically identified; letters of partnership intent, specific support, or other evidence of partnership is included or attached to the proposal. [Given space restrictions in AO proposals, this evidence may be included in the text of commitment/support letters or in a brief summary of support letters.]
- The program clearly defines the terms of the partnership and the nature of the collaboration between scientists and partnering E/PO organizations or individuals is clearly stated. ([See FAQ 23](#)).

Indicators for High Leverage and/or Sustainability include:

- The E/PO activity can achieve high leverage by having an impact beyond the direct beneficiaries, reaching large audiences, being suitable for replication or broad dissemination, or drawing on resources beyond those directly requested in the proposal. (see [FAQ 18](#) for specific examples).

- The program is sustainable beyond initial NASA funding by showing the potential for continuation, adoption by the target audiences, and/or incorporation into institutional programmatic efforts.
- The program is replicable in other educational institutions.

4. Evaluation—The appropriateness of an evaluation plan to document outcomes and demonstrate progress toward achieving objectives of proposed education/outreach activities, commensurate with the scale of the E/PO program.

Evaluation efforts should reveal lessons learned, and whether the proposed E/PO program meets the stated goals and objectives and/or had other unanticipated effects. The formality and comprehensiveness of the evaluation will depend on the scope of the proposed activity and will be different for responses to a NASA Research Announcement (NRA) and Announcement of Opportunity (AO) (see [FAQ 15](#)). Indicators of appropriate evaluation plans include:

- The program is evaluated regularly by credible sources following professionally accepted standards for educational evaluations.
- Evaluation methods provide useful information on the effectiveness of the proposed program and the program implements improvements based on evaluation evidence.
- Evaluations are based on models and techniques appropriate to the scale and type of E/PO products and activities that are a part of the E/PO program.
- There is evidence that the forms of evaluation are based upon reputable models and techniques or are designed and applied by a reputable project partner who is knowledgeable in research and evaluation methods applicable to education and public outreach efforts. Where appropriate, the evaluation plan includes field-testing and modifications before broad dissemination.
- The program collects, analyzes, and reports output and outcome data to a common NASA database to determine program effectiveness and meet the requirements of program stakeholders.

RELEVANCE TO NASA OBJECTIVES

5. Content—Programs make direct use of NASA content, people or facilities to involve educators, students, and/or the public in NASA science, technology, engineering, and mathematics.

Indicators of alignment include:

- The program is based on NASA’s scientific and technical activities, reflecting “As only NASA can.”
- The program ensures that the content is technically accurate.
- The program engages the public in shaping and sharing the experience of exploration and discovery.
- The program is aligned (as described below) with education reform efforts.

Any proposed E/PO product or activity that focuses the formal education system via a curricular product or educator workshop must demonstrate a substantive and informed alignment with educational standards (see [FAQ 10](#)) appropriate to the target audience and scale of the program. National or regional (multi-state) programs should align with the National Research Council's *National Science Education Standards* and/or the American Association for the Advancement of *Science's Benchmarks for Science Literacy*, and/or the mathematics education standards provided by the National Council of Teachers of Mathematics, and/or *Technology Foundation Standards for All Students* from the International Society for Technology in Education (see [Appendix F](#) for links to these and other relevant education standards). This is done by providing specific reference to at least one of the standards publications cited above, citing specific standards to be addressed, and as appropriate providing evidence of use of standards for professional development. Similarly local (single state) programs may choose to align with national or appropriate state standards by providing the same level of documentation. Indicators of appropriate alignment with reform efforts should include one or more of the following:

- Descriptions of curricular products and/or educator training opportunities explicitly acknowledge alignment with education standards in one or more of the following educational fields: science (earth and space science or physical science), mathematics, or technology.
- Evidence that the E/PO partners engaged in developing and evaluating curricular products or educator training are knowledgeable about how to align E/PO products and activities with relevant education standards (see [FAQ 10](#)).
- Existence of substantive links or partnerships that target urban areas, states, and/or regions where National Science Foundation systemic reform efforts (see [Appendix G](#)) have been implemented to increase the scope and impact of the proposed E/PO effort.

6. Pipeline—Through the use of NASA space science, programs/products make a demonstrable contribution to attracting diverse populations to careers in science, technology, engineering, and mathematics (STEM).

Indicators include:

- The program promotes careers in STEM. Approaches include teacher and student use of NASA data, research experiences for students and teachers, exposure to career options through hands-on participation in STEM enrichment programs.
- The program promotes improvement of STEM skills. Approaches include engaging students in participatory activities, such as hands-on learning, research, the use of innovative technology, peer support groups, and mentoring relationships with professionals and college students; involving teachers in effective and extensive staff development opportunities to improve their content knowledge in STEM areas; increasing teacher participation in STEM enrichment programs; and increasing parent awareness of and involvement in student academic progress in STEM activities to strengthen family support of STEM education.
- The program creates linkages to other STEM educational opportunities. Approaches include utilization of partnerships or having substantive linkage with the Math and Science Partnership Program (Department of Education/National Science Foundation) and/or Centers for Learning and Teaching (National Science Foundation) and involvement of community groups, corporations, research laboratories, museums, and educational/professional organizations in STEM activities.
- The program/product addresses diverse populations of students. The overall E/PO program reflects an atmosphere of equity, balance, and inclusiveness

7. Diversity—Through the use of NASA space science, programs reach identified targeted groups and contribute to the involvement, broad understanding, and/or training of underserved and/or underutilized groups in science and technology.

Engaging more minorities and women in careers and greater interest in science and engineering has become an increasingly critical need in America (see [FAQ 5](#)). Indicators that the proposed E/PO programs contribute to underserved and/or underutilized groups (see [FAQ 17](#)) may include one or more of the following:

- The program serves individuals from underrepresented groups and ensures accessibility to people with disabilities.

- The program has been or will be developed in consultation with members of the communities it is intended to serve.
- The program promotes opportunities for faculty at minority-serving institutions to engage in research consistent with NASA's requirements. Approaches include utilization of partnerships or having substantive linkage with one or more minority universities such as: Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs).
- The program supports closing identified gaps in STEM proficiencies among diverse populations. Approaches include utilization of partnerships or having substantive linkage to the NSF rural or urban systemic initiatives, which are expressly designed to reach underserved audiences and minorities.
- The program provides awareness and understanding through culturally appropriate materials to targeted communities of how NASA's research and innovations affect and improve the quality of life for all citizens.

COST

8. Resource Utilization—The adequacy, appropriateness, and realism of the proposed budget including demonstration of effective use of funds.

Indicators include:

- The expected E/PO program outcomes justify/are worth the total program costs
- Proposers provide evidence that the scale of E/PO activity is appropriate to program funding. For example, a \$1.5 million E/PO program is multifaceted and reaches an appropriately large and diverse audience (statewide, regional, or national scope); and a \$15,000 E/PO program is appropriately focused and does not propose unrealistic outcomes that are clearly beyond program resources (see FAQs [14](#), [28](#), and [29](#)).
- The overall program budget (including in-kind contribution and other funds leveraged from E/PO partners' resources) is cost-effective and provides cited or estimated figures for the fiscal contribution of each partner. Overall project cost, costs of project deliverables, and the relationship of proposed budget to available funds are each realistic and reasonable (see FAQ [18](#) and [28](#)).
- Adequate funds are included for E/PO partners commensurate with their level of involvement in proposed activities (see [FAQ 29](#)).

Frequently Asked Questions

Since the previous Guide update in 2002, several FAQs have been added or revised to address current policy, incorporate best practices, and provide more information in support of proposal preparation and understanding the intention of the Evaluation Criteria.

OSS E/PO Policies

1. [What is NASA's Office of Space Science \(OSS\) commitment to Education and Public Outreach \(E/PO\)?](#)
2. [How does the OSS E/PO program relate to the NASA Education Program?](#)
3. [Why has NASA's Office of Space Science \(OSS\) made a major commitment to Education and Public Outreach \(E/PO\)?](#)
4. [What is meant by "K-14"?](#)
5. [Why is OSS placing an emphasis on outreach to underserved and/or underutilized groups?](#)

The OSS E/PO Support Network

6. [What is the OSS Education & Public Outreach Support Network?](#)
7. [How can I use the OSS Education & Public Outreach Support Network?](#)
8. [What will the Forums or Broker/Facilitators do for me? In particular, will they write the E/PO segment to my OSS proposal?](#)

E/PO Content of Proposal Segments

9. [At what level does my E/PO program have to be linked with my research?](#)
10. [What are Science Education Standards, and what does it mean for an educational activity or product to align with them?](#)
11. [What is the difference between "Education" and "Public Outreach"?](#)
12. [What is the difference between "Pipeline" and "Diversity"?](#)
13. [Can OSS E/PO funding be used for Public Affairs efforts to reach the media?](#)
14. [What kind of Education or Public Outreach should I emphasize in my E/PO proposal segment?](#)
15. [What is evaluation and how important is it to include as a funded part of my E/PO program?](#)
16. [Can OSS E/PO funds be used to support efforts directed towards higher education?](#)

17. What is meant by "underutilized" and "underserved" groups in science and technology?
18. How can I expand the scope of my E/PO program in order to get the most out of proposed funding?
19. How can I disseminate products developed by our E/PO program?

E/PO Proposal Preparation and Review

20. Can E/PO just be delegated or contracted out to somebody else so that the science investigators don't have to worry about it?
21. What attributes should I look for in an E/PO partner?
22. In the context of an AO that has advanced to the Concept Study Report phase, what specific requirements must be satisfied for the involvement of E/PO partners, (encompassing partnerships between both individuals and organizations)?
23. What specific requirements apply when partnering with a for-profit organization?
24. What attributes should I look for in an E/PO lead?
25. What is the E/PO proposal review process?
26. How will the E/PO segment affect whether or not my proposal is funded?
27. How can I realistically describe a high-quality AO E/PO program in only a few pages?
28. What format should be used for E/PO budgets?
29. Are there any restrictions on what can be funded in an E/PO budget?
30. For proposals responding to AOs the budget for the E/PO segment is supposed to be 1-2%. Is this 1-2% of the full mission cost, including the launch vehicle?
31. Is E/PO funding added on to a proposal or considered part of the research program funding?
32. If I have a science proposal funded for multiple years, but did not submit an E/PO segment for the first year, may I submit an E/PO segment with my progress report and my "request for funding" for the subsequent years of my award?
33. Is it permissible to submit the *same* E/PO proposal segment with more than one research proposal submitted in response to an NRA?
34. Why will PIs whose E/PO proposals are awarded be asked to report on the results of their E/PO efforts?

Answers to Frequently Asked Questions

FAQs: OSS E/PO Policies

1. What is NASA's Office of Space Science (OSS) commitment to Education and Public Outreach (E/PO)?

Historically OSS has placed a premium on training the next generation of scientists via the support of graduates and postgraduates in their usual scientific roles on research proposals. Such support for future scientists is important and ongoing*. The OSS E/PO program expands the OSS role in education to meet national needs for improving pre-college science education and enhancing general literacy in science, mathematics and technology. This means supporting the involvement of the space science community in partnership with the education community to enhance K-14 science education and the public understanding of science (see [FAQ 3](#) for a definition of "K-14", and [FAQ 16](#) for a discussion of links to higher education that are appropriate to this E/PO program).

OSS is devoting a substantial level of resources toward its E/PO program. Every NASA Office of Space Science (OSS) flight project proposal (AO) is *required* to include a significant segment on E/PO (1-2% of the overall mission budget – see [FAQ 30](#)).

NRA proposers whose research proposals have already been selected for an award are offered four pathways to participate in the OSS E/PO Program.

Option 1: Support of preexisting volunteer efforts;

Option 2: Volunteer to participate in established OSS E/PO programs already underway;

Option 3: Carrying out your own unique E/PO program or in becoming more deeply involved in an ongoing program (see Option 2) through extending its scope or introducing it into a new region of the country.

Option 4: Institutional Proposal" option that allows several OSS-funded space science researchers located at a single institution to collectively plan and carry out a more ambitious, more expansive E/PO program than is possible under Option 3.

For more details on these options, see

(<http://spacescience.nasa.gov/education/scientists/guidelines/guideline.html>)

A national OSS E/PO Support Network of organizations, including four educational "Forums" and seven "Broker/Facilitators" is in place to help OSS investigators and flight projects use the available resources to create and disseminate effective, well coordinated E/PO products and activities (see FAQs [6](#), [7](#), [8](#)). The Support Network works in close

collaboration with NASA's Office of Education as a part of NASA's overall Education effort.

*In general, OSS E/PO resources are not intended to support the higher education of future scientists unless such support is specifically directed toward increasing the participation of minorities and other underutilized groups (e.g., women) in space science and engineering (see FAQs [16](#), [17](#)).

2. How does the OSS E/PO program relate to the broader NASA Education Program?

There is only one NASA Education program. It is directed by the Office of Education. Management of various programs is vested in several organizations including the Office of Education, NASA Enterprises (such as the Office of Space Science), and the NASA Field Centers.

3. Why has NASA's Office of Space Science (OSS) made a major commitment to Education and Public Outreach (E/PO)?

The NASA space science research and development community has earned an international reputation for outstanding scientific achievement. Discoveries are abundant as space scientists quest into the depths of a familiar night sky. This discovery-rich quality also makes space science an inspirational context for science education and public outreach (E/PO). The OSS E/PO strategy reflects the conviction that with key partnerships and cleverly leveraged efforts, the space science community can take greater advantage of its inspirational assets to have a powerful, positive impact on K-14 science education in America (see [FAQ 4](#) for a definition of "K-14", and [FAQ 16](#) for a discussion of appropriate links to higher education).

Successful science education produces a science literate public who appreciates the nature of science; science literate educators, journalists, artists, politicians and business leaders who can recognize and articulate the value of science in society; and a diverse, high-quality technical work force. It is clearly in the enlightened self-interest of the space science community to bring the power of its inspirational endeavors more deliberately to bear in support of these outcomes.

4. What is meant by "K-14"?

Use of the term "K-14" refers to pre-college school grades K-12, plus the freshman and sophomore years of college or university wherein many students are exposed to introductory science courses that have the potential to raise broad understanding and appreciation of science (also see [FAQ 16](#)).

5. Why is OSS placing an emphasis on outreach to underserved and/or underutilized groups?

Profound changes in the composition of the population of the United States are now taking place. According to projections by the Bureau of the Census:

- By 2030, the total elementary school age population of the United States will be equally divided between non-Hispanic whites and all other racial/ethnic groups combined.
- From 2030 to 2050, Native Americans, Asian/Pacific Islanders, Hispanics, and African Americans will together far outnumber non-Hispanic whites in elementary schools, high schools, and new entrants into college and the workforce.
- By 2050, non-Hispanic whites will decline to 53 percent of the total US population (all ages).

Thus, meeting the future needs of a society based on science and technology will require the involvement of individuals from groups who, at the current time, are not as effectively utilized as they should be in science and technology. In addition, these underserved and/or underutilized groups are significantly more underrepresented in space science than they are in science and technology as a whole. OSS is committed to playing a substantive role in addressing the need for outreach to these underrepresented groups to help ensure the future supply of scientists and engineers, and educate all people about the important role that science and technology plays in their lives (see FAQ [16](#), [17](#)).

FAQs: Using the OSS E/PO Support Network

6. What is the OSS Education & Public Outreach "Support Network"?

The OSS "Support Network" is a nationwide infrastructure of space science education/outreach groups whose purpose is to aid space science investigators in identifying and developing high-quality E/PO opportunities. This infrastructure fosters partnerships between the space science and E/PO communities, and provides the services needed to establish and maintain a vital national, coordinated, long-term OSS E/PO program. Of particular interest to OSS proposers are two types of groups whose general aim is to help scientists turn results from space science missions and programs into educationally appropriate activities suitable for regional and/or national dissemination:

- Four educational "[Forums](#)", each one oriented toward one of the four OSS science themes ([Astronomical Search for Origins and Planetary Systems](#), [Solar System Exploration](#), [Structure and Evolution of the Universe](#), and [Sun-Earth Connections](#)). The Forums are co-located with prominent research institutions and are national in

scope. The Forums support, help organize, and disseminate the E/PO efforts of OSS missions and research programs related to their theme.

- Seven regional E/PO "[Broker/Facilitators](#)", each one serving educators and OSS scientists in their assigned regions by helping to identify high-leverage E/PO opportunities and arranging appropriate alliances between the science and education communities. The Broker/Facilitators work across all OSS themes.

Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators may be found by opening *Education* from the menu of the OSS homepage at <http://spacescience.nasa.gov>.

7. How can I use the OSS Education & Public Outreach "Support Network"?

Every prospective or funded OSS E/PO proposer has two primary connections in the "Support Network," — a Forum, corresponding to the particular OSS scientific theme in which the mission's or investigator's research may be classified, and a Broker/Facilitator corresponding to the region of the US in which the investigator works. Funded or prospective OSS investigators, however may choose to consult with any or all Support Network members (Forums or Broker/Facilitators), regardless of location.

Before consulting a Broker/Facilitator or Forum, it is helpful for OSS investigators to prepare answers to the following questions:

- What is the name of the NRA or AO to which you are responding?
- When is the proposal due date?
- Who are the Co-Is on your proposal and where are they located?
- Who are the primary contractors (if any) on your proposal, and where are they located?
- What is the basic science content of your proposal, and to which OSS theme(s) is it linked [Astronomical Search for Origins, Solar System Exploration, Structure and Evolution of the Universe, Sun-Earth Connections]?

The Support Network member will likely want to discuss the following with you:

- What is the education and outreach EXPERIENCE or INTEREST of proposal team members?
- Are you aware of, or particularly interested in, any major education & outreach facilities accessible in your area (e.g. School Districts, School of Education, science

museum, planetarium, observatory, minority institution, educational TV, etc.) with which you could create a partnership or with which you have existing connections?

- How much funding will your proposal devote to education and public outreach?
- Over what time period will E/PO funds be spent?

This set of questions does not constitute an exhaustive list but is intended to stimulate dialogue and the flow of fruitful ideas.

8. What will the Forums or Broker/Facilitators do for me? In particular, will they provide funding or write the E/PO segment to my OSS proposal?

It is not the function of the Forums or Brokers to provide E/PO funding or to prepare E/PO proposal segments. The responsibility for developing the E/PO program and writing the proposal is that of the proposer. However, existing and prospective investigators are strongly encouraged to make use of Forums and Brokers to help identify E/PO opportunities and arrange appropriate alliances between the space scientists and E/PO partners. The integrity of this process is important and is at the heart of the successful implementation of the approach OSS is taking to E/PO. Thus the Forums and Brokers have adopted a set of Operating Principles to ensure that they will provide fair and equitable services to the space science and education communities (see [Appendix B](#)).

FAQs: E/PO Content of Proposal Segments

9. At what level does my E/PO program have to be linked with my research?

The proposed E/PO activities must have an intellectual linkage with the objectives of the parent research proposal and/or the science expertise of its Principal Investigator. OSS desires that the project science be represented in the E/PO project to greatest extent practical. The E/PO project must stay within the same science theme (Solar System Exploration, Sun-Earth Connection, Astronomical Search for Origins and Planetary Systems, or Structure and Evolution of the Universe) as the research. (*A project that only has linkage at the level of astronomy is inappropriately broad.*) However, the details of a particular research project are often too focused and/or too complex to be valuable for general use in K-14 education or public outreach. A knowledgeable assessment of the needs of the audience, such as age-appropriateness, and/or the unique interests or special needs of the particular targeted audience should determine the focus of product or activity design. A public outreach product like an educational TV program might include more specific information about a particular flight project than would an educational product like a middle school Educator Guide. Educational products and services should make use of flight projects or research topics in a different way — more as a motivational *context* for learning fundamental standards-based content in Earth and Space Science, Physical Science,

Mathematics, and Technology (see [FAQ 10](#)). A more detailed discussion of the distinction between “education” and “public outreach” is made in answer to [FAQ 11](#).

10. What are Education Standards, and what does it mean for an educational activity or product to align with them?

This FAQ focuses on the National Academy of Science's National Research Council science education standards. There are also educational standards in science, technology, mathematics, and geography that have been developed by a variety of scientific and educational organizations over the past few years. Prospective proposers and their partners should also be aware of these other disciplinary standards that may be pertinent to their proposed E/PO activities (see [Appendix F](#)).

The National Academy of Science's National Research Council published the National Science Education Standards (NSES) in 1995. This document is based on a nationwide collaboration of educators and scientists and is an important ingredient in modern science education reform efforts. It offers a coherent vision of what it means to be scientifically literate and how best to achieve such literacy.

The NSES content standards describe what all students – regardless of background or circumstance -- should understand and be able to do at different grade levels from kindergarten through high school. The content standards are differentiated by grade level (K-4, 5-8, and 9-12) in concert with the best research on what is developmentally appropriate for students at various ages. The content standards are organized under the following headings: Unifying Concepts and Processes in Science, Science as Inquiry, Physical Science, Life Science, Earth and Space Science, Science and Technology, Science in Personal and Social Perspective, and History and Nature of Science. The way science works and evolves is at least as heavily emphasized as the actual facts and specific ideas in science, and thus scientists can offer perspective on this as well as content knowledge. For space scientists, a good place to begin gaining familiarity is with the content standards in Unifying Concepts and Processes and in Earth and Space Science (see [Appendix F](#) for links to Standards).

A common misconception is that Standards involve content only, as if they were solely a list of facts students should know in science. It is *essential to recognize* that alignment with Standards involves much more than curricular content. There are also standards that articulate best practices in how to teach and assess student learning, how to train and professionally develop teachers, and how school districts and states can support implementation of exemplary curricular materials in an ongoing manner. Thus, aligning an educational product or activity with the *national science education standards* is a challenging prospect that is often underestimated. This points to the value of and need for effective partnering with institutions and/or personnel in the field of education who have studied the Standards carefully and who are knowledgeable and experienced in developing and implementing standards-based instructional materials and practices. Almost any

scientific research project can be intellectually linked to the fundamental science concepts and processes articulated in the Standards, but *linking is not the same as aligning*.

A commonly proposed element of an E/PO program is a curriculum or educator guide. An educator guide that is aligned with Standards has several important attributes: 1) the lesson's content is suitably fundamental and age-appropriate, 2) best instructional practices are built into the lessons, and 3) adequate teacher training is available to support the implementation of the Guide's lessons. These attributes are discussed further below.

The focus of a standards-based lesson or educational experience is on a fundamental concept rather than on details associated with a mission or research project. However, missions and research projects may be used as real-world, inspirational *contexts* for teaching fundamental concepts, say about gravity, or energy, or how scientific inquiry is done. For example, NASA's Cassini mission focuses on the study of the Saturn system. There are no science education standards that say students should learn all about the research conducted by the Cassini mission. However, there *are* Earth and Space science education standards that call for the study of the solar system in general, and the planets in particular. Standards also say students should learn about Systems, Order, and Organization, about Science as a Human Endeavor, and about the relationship between technology and scientific discovery. Cassini's exploration of the Saturn system can provide a motivational context for such standards-based learning.

Another aspect of alignment with Standards is age-appropriateness. It is not realistic to propose producing a standards-based lesson or educator guide that serves *all* grade levels *unless* special consideration is given to how the needs and expected cognitive capabilities of students at different grade levels would be addressed. A standards-based lesson will readily fit into or enhance the existing curriculum of a school devoted to science education reform.

A standards-based lesson also offers the educator/user a sound approach to instruction based on the best available research about how students learn and what teaching practices facilitate that learning. This often involves the use of what is commonly called "hands-on" activities, but this in itself is insufficient to make the lesson pedagogically sound. Sound, standards-based lessons are very similar in structure to the way scientists do science: 1) they raise a fundamental question of interest; 2) they identify what they already know or think they know about the question; 3) they plan and implement an experiment ("hands-on activity") to address the question; 4) they examine what they learned from the experiment and reflect on how it relates to what they thought they knew; and 5) others test them out on what they have learned.

Educator guides are best disseminated in conjunction with educator workshops that include appropriately tailored background on the pertinent science and instructional practices as well as direct hands-on experience with the standards-based lessons of the guide. Workshops aligned with standards model standards-based instruction and explicitly

address both science and best teaching practices. Scientists can be effective contributors in workshop settings, both because of their depth of understanding of basic science and their experience in applying this knowledge to inspirational, real-world explorations.

11. What is the difference between "Education" and "Public Outreach"?

There are no rigorous definitions to differentiate between the two, but for purposes of preparing a high-quality OSS E/PO proposal segment, it may be useful to consider the distinctions discussed below. Simplistically, "education" refers to efforts involving the formal education system and "outreach" to efforts intended to excite wider public interest. There are decided overlaps.

"Education" refers to products or sustained services associated with formal classroom learning such as curriculum development, professional development of teachers, or support for systemic reform efforts. Good science education products and services are characterized by accurate science, practicality of use in the classroom, and sound pedagogy, including awareness of common misconceptions and of what is developmentally appropriate at various ages. Exemplary education products and services are field tested and evaluated before broader dissemination.

"Public Outreach" may be thought of as referring to products or services that involve one-time or short-duration contact with the public -- contact that informs, excites interest, and arouses curiosity. Public Outreach sometimes has an element of entertainment, and it often involves ways of reaching out where the public is tuned in to hear or see. Public Outreach products and services include such things as science articles in the media and popular magazines, educational TV shows, radio programs, and Internet events. In many cases, a person need not move from their home to access or benefit from the outreach event.

The overlap between Education and Public Outreach [see [Appendix C](#) for E/PO Venn diagram] is sometimes overlooked, but it is a significant area of endeavor called "Informal Education". Informal education engages students, educators, and the general public in settings away from the classroom (e.g. school field trips to science centers). Informal education products combine educational substance with the excitement of successful public outreach, but without the pressure of examinations and assessment. Opportunities for informal education usually require a person to travel to a place outside the home like a nature center, museum, or planetarium – a place that can be revisited. Informal education includes things like museum exhibits, science center programs, and planetarium shows. It also can include educational activities carried out by community organizations such as scouts, girls and boys clubs, 4H, and other youth groups. The intention of Informal Education is both to provide a learning opportunity and to motivate further learning and life-long interest.

Depending on their design, many products and services, such as Web sites, videos, and CD-ROMS, may be structured as informal education, or tailored more toward formal

education or toward public outreach. For example, a CD-ROM might contain an interactive, standards-based curriculum for use in the classroom (formal education), or it might be an archive of captioned images for use on home computers (public outreach), or it might serve an interactive kiosk in a science museum exhibit (informal education). A website may also be cast across the E/PO spectrum. A Web site can be used to deliver a standards-based distance learning course (Formal Education), or to provide the public with a description of the latest images from another planet (Public Outreach).

Note that there are other classes of Public Affairs or Public Relations products and services that do not generally fall into the domain of E/PO as defined above (see [FAQ 13](#)). While such activities are important avenues for reaching the public, they are outside the scope of the OSS E/PO program.

12. What is the difference between “Pipeline” and “Diversity”?

Projects that focus on *Diversity* are primarily concerned with using NASA space science as a means of engaging of individuals from groups that are underutilized and/or underserved in science and technology (see [FAQ 17](#)).

Projects that focus on *Pipeline* are primarily concerned using NASA space science as a means of increasing the number of students in general, that develop high proficiency in those skills suitable to successful pursuit of STEM careers. This could include programs focused on retention of students in STEM subject areas and/or efforts to increase the students in STEM subject areas. Approaches include:

- Teacher and student use of NASA data, research experiences for students and teachers, exposure to career options through hands-on participation in STEM enrichment programs.
- Engaging students in participatory activities, such as hands-on learning, research, the use of innovative technology, peer support groups, and mentoring relationships with professionals and college students; involving teachers in effective and extensive staff development opportunities to improve their content knowledge in STEM areas; increasing teacher participation in STEM enrichment programs; and increasing parent awareness of and involvement in student academic progress in STEM activities to strengthen family support of STEM education.
- Utilization of partnerships and/or having substantive linkage with national programs (e.g. the Math and Science Partnership Program [Department of Education/National Science Foundation] and/or Centers for Learning and Teaching [National Science Foundation]) or involvement of community groups, corporations, research laboratories, museums, and educational/professional organizations in STEM activities.

“Pipeline and Diversity” are areas of special interest to the OSS E/PO program. Projects should identify how they support these areas and may wish to focus project elements on them.

13. Can OSS E/PO funding be used for Public Affairs or Public Relations?

In general, no. Public Affairs or Public Relations (PR) products and activities are important to public awareness, but they are not appropriate for funding by the OSS E/PO program. PR products may include press conferences, press releases, video clips, mission-related brochures, posters, lithographs, and toys. Some of these products can be tailored or modified for E/PO uses. For example, a poster or toy could be packaged with an educational guide or insert that takes advantage of the interest and learning opportunity stimulated by the poster image or the playful appeal of the toy. A video clip and text from a press release might be adapted for use in a teacher guide or workshop. Such tailoring or development of educational products to accompany PR products is potentially fundable with OSS E/PO funds, but it should not dominate an E/PO proposal. In particular, OSS resources for E/PO should not be used for "give-away" souvenirs like coffee mugs, lapel pins, patches, T-shirts, mouse pads, and other items of limited educational value.

14. What kind of Education or Public Outreach should I emphasize in my E/PO proposal supplement?

There is no single answer to this question as there are a wide spectrum of acceptable E/PO products and activities (see FAQs [11,13](#)), some of which may be of greater value for a particular locale or region. There may also be geographically convenient partnership opportunities—such as with a nearby science museum or planetarium that can serve to motivate particular types of E/PO activities. The OSS E/PO Effort recognizes that various audiences have different needs, and that impact manifests itself differently within each group of users. (See [OSS E/PO Evaluation Report \(2004\), Lesley University](#).)

The answer to the question also depends strongly on the amount of funding being proposed for E/PO. Because of the modest financial scope of NRA programs, an educationally sound, well-posed and focused effort that will be clearly effective in reaching its intended target audience is preferable to an unrealistically broad effort. On the other hand, E/PO programs associated with AOs have a much larger financial scope and thus are expected to have a breadth and depth commensurate with these greater resources. These larger programs should have a more balanced portfolio of activities and intended audiences with state, regional, or national scope. This general guidance is not meant to discourage the development of a novel E/PO idea that is more focused on a particular activity or target audience so long as the scope of the idea clearly merits the proposed funding.

Abstracts of previously selected OSS E/PO programs can be found by selecting a year at http://research.hq.nasa.gov/code_s/archive.cfm

For a menu of ideas and opportunities for scientists to become involved in E/PO, please see [Appendix A](#) for the link for the Menu of Opportunities for Scientists Involvement in Education (MOSIE).

15. What is evaluation and how important is it to include as a funded part of my E/PO program?

Evaluation¹ of E/PO efforts is essential, particularly for larger scale programs. The general goal of all E/PO efforts is to accomplish something (e.g., teach, inform, excite, etc.). While it is possible to accomplish something without realizing it, it is also possible to believe falsely that there have been accomplishments in the absence of validating evidence. It is thus necessary to investigate how well the outcomes of E/PO efforts actually match with their intended effectiveness and impact. Just as scientific claims must be testable and tested before they are accepted, so must claims about E/PO accomplishments be substantiated with evaluation.

Evaluation should be geared to the scale and type of a proposed E/PO effort. Smaller E/PO programs, such as those responding to an NRA, might use simple, informal, or very specific evaluation methods like pre- and post-tests, questionnaires, or a focus group. It is useful to follow standard methods or consult an individual trained in research and evaluation methods when designing an evaluation procedure, even when the evaluation is to be done informally by the proposer(s).

Larger E/PO programs, such as those responding to an AO, should integrate a more formal, comprehensive, and structured approach to evaluation. Missions typically devote 5-10% of the E/PO budget for evaluation and usually hire an independent professional evaluator to conduct a more substantial assessment and to produce a more formal and objective report on the program as a whole as well as on its component E/PO activities. Missions are also encouraged to seek out evaluators who are familiar with the unique OSS Education and Public Outreach objectives and requirements.

For large scale E/PO projects or programs there are generally three stages of evaluation. "Front End" evaluation, done very early in the planning stages, can help determine where there is need, interest, or potential confusion regarding an envisioned E/PO product or activity and its intended audience. "Formative" evaluation improves the E/PO effort while it is being developed: field testing is a good example of formative evaluation. "Summative" evaluation looks at the results of an effort: how effective it was, whether it met the stated intentions, whether it had other unanticipated effects, and so on. Summative evaluation

¹ The Space Telescope Science Institute IDEAS program provides an excellent primer on evaluation that is relevant to NASA OSS E/PO programs. The URL is: <http://ideas.stsci.edu/Evaluation.shtml>

tends to be the most formal and is often done to publish the lessons learned so they can be used for future projects. Methods of evaluation include focus groups, surveys, observations, follow-up interviews, pre- and post-testing, and many other techniques.

16. Can OSS E/PO funds be used to support efforts directed towards higher education?

In general, no. OSS E/PO funds are intended to support K-12 education and public outreach rather than higher education. However, there are important exceptions such as undergraduate programs to enhance the science literacy of non-scientists and future K-12 teachers, and to increase the participation of minorities and other underutilized groups (e.g., women) in science, technology, engineering, and mathematics.

Historically, OSS has placed a premium on training the next generation of scientists via the support of graduates and postgraduates in their usual scientific roles on research proposals. Science and engineering undergraduates have also become increasingly involved in OSS mission operations and scientific research. OSS support for future scientists and engineers is important and ongoing. However, there are other channels available to fund such activities, and they are not the focus of the OSS E/PO initiative. There are other aspects of higher education that are consistent with the aims of the initiative. The list below offers some of the ways OSS E/PO funds could be used. This list is not meant to be comprehensive, but to convey the spirit of the OSS E/PO initiative vis-à-vis higher education:

- collaboration between space science departments and schools of education to enhance the science literacy of undergraduates preparing to become K-12 teachers
- employing a graduate student in education to work on the design and development of educational products and materials or the evaluation of an E/PO activity
- enhancing introductory undergraduate courses in space science for non-science majors at community colleges as well as 4-year colleges and universities (see [FAQ 3](#))
- collaborations with minority institutions to develop undergraduate coursework and/or experiential opportunities that promote increased minority interest and participation in science and engineering (see [FAQs 5, 17](#))
- workshops on how to do successful classroom outreach for science and engineering graduates and undergraduates involved in OSS research and development efforts

Graduate and undergraduate science students and post-docs can be funded by the OSS E/PO initiative provided that this support is for their substantive contribution to E/PO activities rather than for their contributions to scientific research or operations. Such E/PO experience can broaden the training of these individuals and may offer the prospect of a more diverse set of career paths.

17. What is meant by "underutilized" and "underserved" groups in science and technology?

The terms "underutilized" and "underserved" have special meaning in this context. In Equal Opportunity organizations, the operative phrase is "underrepresented in science and engineering" which is currently defined as individuals of Hispanic, African American, Pacific Islander, and Native American origins. In particular, all federal agencies, including NASA, have legislative and White House mandates to increase their support to minority universities. Such universities include Historically Black Colleges and Universities (HBCUs), Hispanic Serving Institutions (HSIs), Tribal Colleges and Universities (TCUs), and other institutions certified by the Department of Education as having more than 50% combined minority undergraduate enrollment. A complete list of all accredited minority institutions is available from the Department of Education at <http://www.ed.gov/about/offices/list/ocr/edlite-minorityinst.html> (also see [Appendix H](#)). The Office of Space Science has funded a group of minority university institutions around the country to support undergraduate curriculum development, faculty enhancement, and K-12 educational outreach. Contact a Forum or regional Broker/Facilitator if you are interested in exploring a suitable partnership opportunity with one of these institutions. See [FAQ 6](#) for leads to the Forums and Broker/Facilitators.

The terms "underutilized" and "underserved" encompass "underrepresented," but also include more. Use of the term "underutilized" recognizes that there are groups of people who have the talent and ability to participate in the OSS program and thus should be involved, but for one reason or another, they are not now involved. Such groups obviously include minorities but also include women and the physically challenged.

Use of the term "underserved" recognizes that there are people in areas where goods or services are in short supply. For example, this term is usually applied to individuals in small towns, rural communities or in economically depressed areas where key services are frequently not available. The usage of "underserved" in this context is also intended to include groups with which NASA has not historically had a significant relationship, such as students at community colleges.

18. How can I expand the scope of my E/PO program in order to get the most out of proposed funding?

This is an important aspect of the [OSS E/PO Evaluation Criteria](#) (see [EC 3](#)) and addressing it is a central consideration in the overall approach OSS has taken towards E/PO. The OSS-supported space science community is quite small (approximately 10,000 to 20,000 including aerospace contractors). The education community is enormous by comparison. [Appendix D](#) contains some perspective—giving statistics on the number of students, teachers, school districts, and so on. To have a significant national impact, OSS must leverage its E/PO resources carefully to get the most out of every dollar invested. The

products and activities must be highly valued and worthy of broad dissemination and use in the education and outreach communities.

There are many strategies for enhancing the value or cost-effectiveness of an E/PO program including the creative use of existing space science community resources (see [FAQ 19](#)) in support of E/PO (e.g., scientists and engineers, observatories, mission operations facilities, computers, science imagery and other data). Some general strategies to expand the scope of an E/PO program or activity are listed with examples below:

- having a substantive impact beyond the direct beneficiaries (e.g. having a "waterfall effect" where a program trains master educators who in turn train other K-12 teachers, or where scientists partner with an education graduate student who will in turn teach future teachers)
- capitalizing on dissemination techniques and infrastructures that can reach relatively large audiences (e.g. science museums, planetariums, radio, television, Internet, traveling exhibits – see [FAQ 21](#)).
- making the case that the design of a proposed product or activity qualifies for replication or broad dissemination by organizations and programs with established and reputable means for doing so (e.g., an Educator Guide qualifies for dissemination in the Web-based Eisenhower Clearing House of educator resources or is suitable for distribution via NASA's national network of Educational Resource Centers; an educator workshop qualifies to be presented at the National Science Teachers Association convention)
- drawing on (or leveraging) resources beyond those directly requested (e.g. E/PO partners provide cost sharing, in-kind contributions, or existing capability and infrastructure that would be cost ineffective to recreate from scratch)

19. How can I disseminate products developed by our E/PO program?

The Space Science Education Resource Directory (<http://teachspacescience.stsci.edu/>) is a convenient way for you to make your educational product available for use in classrooms, science museums, planetariums and other settings. The directory allows prospective users to do a quick search by Grade, Subject or Topic.

All NASA-sponsored grantees are invited to submit their outstanding OSS education products and resources for K-12 audiences for review (<http://www.strategies.org/SpaceScienceReview.html>). All products developed or funded by NASA's OSS are eligible to enter the review process. This review does not take the place of formative evaluation of education materials and it is expected that products have been reviewed for scientific accuracy and educational value, as well as field-tested by teachers and/or students as appropriate.

Other dissemination routes include utilization of the OSS Support Network, and other NASA resources such as the NASA Space Grant Consortia and NASA Aerospace Education Specialists.

FAQs: E/PO Proposal Preparation and Review

20. Can E/PO just be delegated or contracted out to somebody else so that the science investigators don't have to worry about it?

No. The deliberate intention of the OSS E/PO strategy is to increase the degree to which the OSS-funded space science community is active and effective in support of public outreach and education. While some scientists have had significant experience in E/PO, many have not, and thus it has proven an effective strategy to form partnerships with organizations or individuals in the E/PO communities who can identify efficient ways for scientists to play valuable roles.

While a proposal team may select an E/PO partner institution or qualified E/PO Co-Investigator to lead the implementation of an E/PO program, it is expected that one or more science team members will be directly involved in overseeing and carrying out the proposed E/PO program. The essential idea is that attention to E/PO becomes an integral part of the space science community's professional activities. It may be useful for OSS investigators to participate in workshops that offer training for scientists on E/PO.

There are a variety of roles that can be played by space scientists besides the most easily imagined one of public or classroom presenter. (See [Appendix E](#) for a chart depicting a sampling of roles scientists can play in support of education and public outreach). The key is to combine roles that fit the interests and abilities of participating scientists with partners who can provide further expertise in E/PO and opportunities for enhancing the scope of the proposed activities (see FAQs [18](#), [21](#)).

21. What attributes should I look for in an E/PO partner?

Desirable qualities to look for may include:

- substantial experience in managing the development of space science-related E/PO products and activities
- significant experience in presenting space science effectively to a large and diverse public audience
- a history of positive professional association with both the science and education communities

- credible expertise relevant to the assigned E/PO program element (e.g., a curriculum guide would require an E/PO partner who is intimately familiar with what it means to align with science education standards [see [FAQ 10](#)])
- openness and ability to engage scientists in meaningful and efficient ways in E/PO efforts (see [FAQ 20](#))
- geographical or institutional desirability in terms of access to proposal scientists and/or to underserved or underrepresented populations
- willingness to contribute the use of existing infrastructures, capabilities, or programs that could be leveraged for dissemination or evaluation of E/PO products and events (e.g., museum and planetarium programs, an ongoing series of educator workshops, a distance learning infrastructure, a national network of outlets for educational resources, or a radio/television/Internet broadcast capability)
- willingness to provide matching funds or in-kind contributions.

22. In the context of an AO that has advanced to the Concept Study Report phase, what specific requirements must be satisfied for the involvement of E/PO partners, (encompassing partnerships between both individuals and organizations)?

An E/PO Partner is defined as individual or organization who plays a necessary role in the proposed Education and Public Outreach Program and whose services are either funded by NASA or are contributed by his/her employer. If funded by NASA, costs must be accounted for in the NASA OSS Cost. If contributed, the costs must be accounted for in the Total Mission Cost and an endorsement letter from the proposed E/PO partner's home institution with full legal authority to approve the terms of the partnership must be provided with the proposal or Concept Study Report in the case of an AO. In addition, the role of each E/PO partner must be adequately described in the proposal or concept study report to demonstrate the nature of the partner contribution and the associated costs. Note that the identification of an unjustified number of E/PO partner(s), partner(s) without a clearly defined role or contribution, or partner(s) without adequate legal authorization to participate may result in downgrading of an investigation and/or the offer of only a partial selection by NASA.

23. What specific requirements apply when partnering with a for-profit organization?

NASA policies prohibit offering a grant, contract or subcontract for the sole purpose of generating a potentially marketable (retail/for profit) educational end-product such as a video, CD-ROM, slide set, poster, computer software, or web-based activity/resource. Funds can be awarded for an educational activity that might incorporate the use and assessment of a developed product. Example: A proposed program may involve the development of an educational product, but this product would be part of a larger activity

and would be distributed either for free or at cost, and be subject to all OSS E/PO Evaluation Criteria.

In addition, it is strongly encouraged that any E/PO co-investigator or partner/individual with a salaried position in a for-profit company sign a non-disclosure agreement to avoid potential conflicts of interest directly related to the intellectual property rights of other E/PO team members and partnering institutions. If an individual or company is unwilling to comply with this request, it is usually not advisable to proceed with the proposed partnership.

24. What attributes should I look for in an E/PO lead?

Personnel leading E/PO projects should be suited to the scope and content of the proposed program and qualified by education, training, and experience to manage such programs. E/PO mission leads are key personnel and their selection should be made with as much rigor as science team members. [Appendix I](#) provides a sample position description and qualifications used by a mission to select an E/PO lead.

25. What is the E/PO proposal review process?

Separate reviews are made of the science and E/PO segments of OSS proposals by different review panels. The process of handling E/PO proposal segments follows the known best and fair practices for proposal review in current use throughout OSS. (See the *Guidebook for Proposers Responding to NASA Research Announcements*, [Appendix C](#), which is available at <http://www.hq.nasa.gov/office/procurement/nraguidebook/>.)

To ensure quality and consistency in the review process, experience to date has demonstrated that review panels for the E/PO segment must include both educators and scientists. The substance of these reviews is conveyed to proposers as part of their usual debriefings (see [FAQ 26](#)).

In order to avoid “Conflict of Interest” during the review process, it is essential that all key personnel including the E/PO lead for AOs are identified and names and addresses of all current institutions of employment be provided.

Reviews are held several times each year for NRA E/PO proposals.

A sample Review Form is provided in [Appendix J](#).

26. How will the E/PO segment affect whether or not my proposal is funded?

For both AOs and NRAs, appropriately qualified scientific, education, and outreach personnel evaluate E/PO proposal segments using the OSS E/PO Evaluation Criteria. Proposers should consult individual AOs and NRAs for further specific requirements and information.

For NRAs the option to propose an E/PO program is offered only to those proposers whose research proposals have already been selected for award. For those proposers whose parent research program has been awarded funding, four pathways or "Options for E/PO participation" in the OSS E/PO program are offered (<http://spacescience.nasa.gov/education/scientists/guidelines/guideline.html>).

An E/PO program is a required component for AOs. The OSS Selecting Official takes into account proposed E/PO tasks and their review ratings when deciding on final selections and in particular when discriminating between research proposals having otherwise comparable merits. In the case of AOs, E/PO can play a significant role in discriminating among closely competing proposals. However, for mission proposals (e.g. Discovery, MIDEX) or major instrument proposals, other factors beyond both science and E/PO—such as risk, cost, and programmatic considerations also play a major role in the selection process.

27. How can I realistically describe a high-quality AO E/PO program in only a few pages?

Admittedly, four pages is a very small space to devote to describing how a proposed flight project will spend hundreds of thousands or even millions of dollars on E/PO in a manner that meets all OSS E/PO Evaluation Criteria (EC). There is not room to provide a great deal of programmatic or budgetary detail in a flight project proposal. However, proposers can use the space allotted very effectively to provide key information to reviewers. Listed below is one possible strategy for making efficient use of space in providing this key information:

- A brief opening statement of how the proposed program will help achieve the goals of the OSS E/PO strategy and implementation plans
- A clear and succinct statement of program goals and objectives (see [EC 1](#))
- A paragraph to indicate the proposal team's commitment to E/PO, including a brief description of which science team member will have overall E/PO oversight, how scientists' will be involved with E/PO partners, and how E/PO implementation will be managed and coordinated (see [EC 3](#), and [FAQ 20](#))
- Substantiation of capability and commitment of E/PO partners via support letters that may be attached at the end of the proposal (see [EC 3](#))
- A collection of brief paragraphs (1-2 pages) introducing the basic "Who, What, Why, and How," for each E/PO activity or product that will serve to fulfill program goals and objectives (see [EC 1](#) and FAQs [11](#), [13](#), [14](#)). The descriptions for each E/PO activity should emphasize:

1. what audience and educational needs are being addressed and why this is important (see for example [EC 2](#), [6](#), [7](#) and [FAQ 5](#), [17](#));
 2. the substantive involvement of appropriate and demonstrably capable partners (with reference to any support letters, see ECs [2](#), [3](#), [FAQ 21](#));
 3. how the E/PO activity aligns with science education standards (if relevant, see [EC 5](#), [FAQ 10](#)); and
 4. how the E/PO activity will expand its scope (see [EC 3](#), [FAQ 18](#)).
- A table to summarize E/PO activities, including partners/leads, estimated costs and timing (0.5 –1 page). Table headings could include "E/PO Activity or Product", "E/PO Partner/Lead", "Estimated Cost", and "Schedule" (see EC [1,3](#) and [FAQ 28](#))
 - A short section to describe what approaches will be used to evaluate E/PO activities and the overall E/PO program (see [FAQ 15](#), [EC 4](#)).
 - A paragraph to mention general dissemination strategies and to summarize the expected impact of the proposed E/PO program (see [EC 1](#) and [EC 3](#)).

28. What format should be used for E/PO budgets?

For NRAs, the E/PO narrative and budget must be submitted using the online submission form (<http://props.oss.hq.nasa.gov>) which includes standard NASA budget summary templates. Once again, please note that the option to submit an E/PO proposal in conjunction with NRAs is offered only to those proposers whose parent research proposals has already been selected for an award. Please refer to the *E/PO Guidelines for NRAs* (<http://spacescience.nasa.gov/education/scientists/guidelines/guideline.html>) for additional information.

For AOs it is important to refer to the specific Announcement for guidelines on budget formatting. In general, AO proposers should integrate the E/PO budget into the *Budget Summary* of the parent proposal. Proposers may find it useful to provide a summary table in the text of the E/PO segment that lists "ball-park" costs for each E/PO product or activity (citing clearly any cost sharing or in-kind contributions). This table offers reviewers a useful way of assessing whether the proposed E/PO program and the proposed budget are a realistic and cost-effective match.

The E/PO proposal must reflect the entire cost of the E/PO program including cost sharing and in-kind contributions. The budget should indicate the amount (if any) of cost sharing and in-kind contributions.

Cost Sharing includes items such as waiver or reduction of overhead expenses, personnel costs, and/or other direct charges.

In-kind contributions includes the value of services rendered, goods donated, facilities provided.

29. Are there any restrictions on what can be funded in an E/PO budget?

All costs must be allowable under Federal Regulations. Beyond that there are some recommended guidelines in keeping with the spirit and purpose of the OSS E/PO initiative:

Salaries and Wages: These should not generally include salaries for science investigators, postgraduates, or graduate students in science (however, see [FAQ 16](#)). Adequate funds should be included for E/PO partners commensurate with their level of involvement in proposed activities.

Equipment: It is not the intent of the E/PO program to purchase equipment for general use in schools, museums, planetariums, or other institutions. There must be a detailed justification for any equipment, including how it will be incorporated as an essential component into a large-scaled educational activity. Any requests for equipment must also be accompanied with certification that it will be used strictly for educational purposes both during the program and once the program is completed. Hardware such as computers, telescopes, and so on should be ancillary to the E/PO activities being proposed rather than the primary use of funding. Requested items must be essential to the successful of the project. In any event, no more than 50% of the total budget (including cost sharing and in-kind contributions) may be used for this purpose.

Travel: Travel for investigators is acceptable if it is for the purpose of disseminating information about the E/PO activities, or for the purpose of attending an E/PO training or workshop for scientists. In the case of AOs, travel money for investigators may be used to support participation in E/PO planning and/or implementation of E/PO activities.

Meals and Coffee Breaks: When certain meals are an integral and necessary part of a conference (e.g., working meals where business is transacted), grant funds may be used for such meals. Grant funds may also be used for furnishing a reasonable amount of hot beverages or soft drinks to conference participants and attendees during periodic coffee breaks.

Indirect Costs: OSS requests (but does not require) that the institutional overhead for an E/PO budget be reduced or waived by the submitting organization, since such activities in many cases will be of direct value to local educational and/or public science institutions and the budget available for this OSS E/PO program is extremely restricted.

For proposals responding to AOs the budget for the E/PO segment is supposed to be 1-2%. Is this 1-2% of the full mission cost, including the launch vehicle?

30. For proposals responding to AOs the budget for the E/PO segment is supposed to be 1-2%. Is this 1-2% of the full mission cost, including the launch vehicle?

The operational policy is that the E/PO budget is 1-2% of the mission cost, NOT including the launch vehicle. So E/PO funding should be 1-2% of the total mission cost for spacecraft, operations, and science.

31. Is E/PO funding added on to a research proposal budget or considered part of the research program funding?

In the case of NRAs, E/PO funding is considered as an add-on, over and above any funding guidelines for research proposals that are given in the NRA. E/PO segments for NRA proposals are funded using resources separate from those used for research grants. For AOs the E/PO budget is considered integral to the overall mission cost (see [FAQ 30](#)).

32. If I have a science proposal funded for multiple years, but did not submit an E/PO segment for the first year, may I submit an E/PO segment with my progress report and my "request for funding" for the subsequent years of my award?

The PI of an existing multiple year OSS NRA award having at least one year remaining in its period of performance may submit an E/PO proposal as a supplement to that parent research award no later than 75 days before the yearly anniversary date of the award, with the anticipation of starting the proposed E/PO activity in conjunction with the next yearly funding supplement of their multiple year award. The period of performance for such a supplemental E/PO activity is limited to the balance of the period of performance of the research award. Such a supplemental E/PO proposal must be submitted using the *online submission form* (<http://props.oss.hq.nasa.gov>). See the **Guidelines for NRAs** (<http://spacescience.nasa.gov/education/scientists/guidelines/guideline2.html>) for format and content recommendations. If accepted, the E/PO funding will start on the anniversary date of the parent award, and its period of performance may not exceed that of its parent.

33. Is it permissible to submit the same E/PO proposal segment with more than one research proposal submitted in response to an NRA?

OSS recognizes that some proposers may awarded funding for (i) research proposals in more than one program element in a NRA, or (ii) more than one research proposal to the same program element of a single NRA. In either case it is permissible to submit the *same* E/PO proposal for these research proposals with the understanding that OSS will review such an E/PO proposal *only the first time it is submitted*. The online submission provides an opportunity to indicate that an E/PO proposal has been previously submitted in conjunction with another research proposal for a given NRA under the "Previous Submission Information" section. Under this section the proposer must note the title(s) and winning proposal number(s) of any other Winning Science Research Awards for which the same E/PO proposal

is being submitted. The one evaluation will carry through to all further submissions of that E/PO proposal for that one NRA. Note that in such a case the PI must resubmit the E/PO proposal in the identical form as it was the first time. Reviewers will not separately evaluate E/PO proposals that have only minor changes between such multiple submissions. Of course reviewers will consider individually E/PO proposals that are substantially different.

In addition, if there are a number of investigators at a particular institution who are submitting individual research proposals in response to the same NRA, it is possible to submit a combined, Institutional E/PO proposal of larger scope rather than submitting individual E/PO proposals. For additional information for the submission of an Institutional E/PO Proposal, see the Guidelines for NRA E/PO programs, Section A (Options for E/PO Participation) (<http://spacescience.nasa.gov/education/scientists/guidelines/guideline.html>)

34. Why will PIs whose E/PO proposals are awarded be asked to report on the results of their E/PO efforts?

In order to maintain a comprehensive picture of the entire portfolio of OSS E/PO programs and activities, (as well as for OSS to be able to recognize and acknowledge all contributions to E/PO by the space science community) it is extremely important that all E/PO activities be reported. A one-page progress report and continuation request should be submitted along with the continuation request and progress report for the parent research proposal. When you submit your progress report and continuation request, we also ask that you submit the information for your E/PO program or activity for the *Office of Space Science and Public Outreach Annual Report* (<http://ossim.hq.nasa.gov/ossepo/>). Finally, we also suggest that volunteer activities be reported directly to your Regional Broker.

As an integral part of its E/PO program, OSS has employed a highly qualified team of evaluators to assess and critique the program as a whole. A portion of this evaluation involves gaining a more comprehensive picture of the entire portfolio of E/PO efforts supported across all OSS programs. The evaluation data and information (<http://spacescience.nasa.gov/education/resources/evaluation/index.htm>) has helped to substantiate that OSS-sponsored scientists are contributing to larger national needs in education and the public understanding of science. In addition, the data collected will help ensure that OSS scientists can receive appropriate NASA, OSS, and community recognition for making such contributions.

Appendices

Appendix A

Key NASA Links

NASA Strategy and E/PO Implementation Documents

"Partners in Education: A Strategy for Integrating Education and Public Outreach into NASA's Space Science Programs"

<http://spacescience.nasa.gov/admin/pubs/edu/educov.htm>

"Implementing the Office of Space Education & Public Outreach Strategy"

http://spacescience.nasa.gov/admin/pubs/edu/imp_plan.htm

"Implementing the Office of Space Science Education/Public Outreach Strategy: A Critical Evaluation at the Six-Year Mark"

http://spacescience.nasa.gov/education/resources/evaluation/OSS_EPO_Task_Force_Report.pdf

OSS E/PO Evaluation Report (2004), Lesley University

http://spacescience.nasa.gov/education/resources/evaluation/OSS_EPO_Phase_III_Report.pdf

History of OSS E/PO Program

http://spacescience.nasa.gov/education/history/Cospar_Manuscript.pdf

NASA Space Science Enterprise 2003 Strategy

http://ifmp.nasa.gov/codeb/docs/2003_Strategic_Plan.pdf

NASA Education Enterprise Strategy

http://education.nasa.gov/education_strategy.pdf

NASA Strategic Plan

http://ifmp.nasa.gov/codeb/docs/2003_Strategic_Plan.pdf

OSS Education and Public Outreach Annual Reports

<http://ossim.hq.nasa.gov/ossepo/>

OSS E/PO Newsletters

<http://spacescience.nasa.gov/education/news/index.htm>

NASA Information

NASA Office of Space Science

<http://spacescience.nasa.gov/>

NASA Office of Education
<http://education.nasa.gov/>

NASA SpaceLink - main Web site for online access to Education Enterprise resources
<http://spacelink.nasa.gov/>

Useful Resources for Scientists and Educators

NASA Office of Space Science Education Resource Directory
<http://teachspacescience.stsci.edu/cgi-bin/ssrtop.plex>

The Education Resource Directory provides Internet access to top-quality educational resources produced by NASA's Space Science Education and Public Outreach programs

NASA Office of Space Science Education and Public Outreach Annual Reports
<http://ossim.hq.nasa.gov/ossepo/>

OSS E/PO Evaluation Report (2004), Lesley University
http://spacescience.nasa.gov/education/resources/evaluation/OSS_EPO_Phase_III_Report.pdf
Discusses the impact of the OSS E/PO program on various audiences and identifies program attributes that contribute to impact.

Voyages in Education and Public Outreach: A NASA Office of Space Science Newsletter
<http://spacescience.nasa.gov/education/news/index.htm>
Voyages is a continuing newsletter that serves as a vehicle for sharing the NASA Office of Space Science's latest events and accomplishments in Education and Public Outreach. Past and current issues are available here.

Abstracts of ROSS E/PO Proposals
http://research.hq.nasa.gov/code_s/archive.cfm
E/PO proposal abstracts for 2000-2002 are available. Select the year of interest from this URL.

Space Science Access: Bringing the Universe to Museums and Planetariums
<http://mo-www.harvard.edu/spacescienceaccess/>
NASA's Office of Space Science Recognizes that planetariums, science centers, and museums are vital venues for astronomy and space science education. This Web site aims to support the efforts of these informal science education organizations.

Space Science Media Needs of Science Center Professionals”
<http://cse.ssl.berkeley.edu/spacescience.pdf>
The Sun-Earth Connection Education Forum interviewed twenty-nine science center professionals to explore ways to better meet their media needs. (“Media” refers to images, animations, simulations, and videos, etc., available via the web.) Key recommendations are discussed.

Special Needs Resource Group

<http://serch.cofc.edu/serch/special/snrg.htm>

This group provides OSS mission planners/principle investigators and product developers with guidance, support, and product enhancement strategies; hence improving the usability of OSS products by audiences concerned with the education of individuals with special needs.

Small and Medium Size Planetarium Projects

<http://analyzer.depaul.edu/NASABroker/GLPA/Default.htm>

Resources geared to the needs of Small and Medium Size Planetariums.

A Menu of Opportunities for Scientists in Education (MOSIE)

<http://ssibroker.colorado.edu/broker/MOSIE/Default.htm>

MOSIE is intended for space scientists which receive OSS research awards and wish to become involved in a related Education or Public Outreach (E/PO) program. It provides both ongoing opportunities that scientists could plug in to, either as volunteers or as part of a funded projects, as well as examples and ideas for E/PO proposals.

Roles Matrix for Scientists in Education and Public Outreach

<http://ssibroker.colorado.edu/Rolesmatrix/>

The Roles Matrix is designed to raise awareness about the great diversity of education and public outreach roles scientists can play. The Matrix offers a framework that describes the different levels of involvement in a variety of activities that contribute to improving science education in both formal and informal settings.

NASA Educational Resources In Other Languages

http://www.uidaho.edu/ed/nasa_rerc

A comprehensive list of over 50 NASA programs and resources in Spanish and many other languages. Click on the link *Materials in Other Languages*.

Trends in International Mathematics and Science Study

<http://nces.ed.gov/TIMSS/>

Trends in International Mathematics and Science Study (TIMSS, formerly known as the Third International Mathematics and Science Study) resulted from the American education community's need for reliable and timely data on the mathematics and science achievement of our students compared to that of students in other countries. TIMSS is the most comprehensive and rigorous assessment of its kind ever undertaken. Offered in 1995, 1999, and 2003, TIMSS provides trend data on students' mathematics and science achievement from an international perspective.

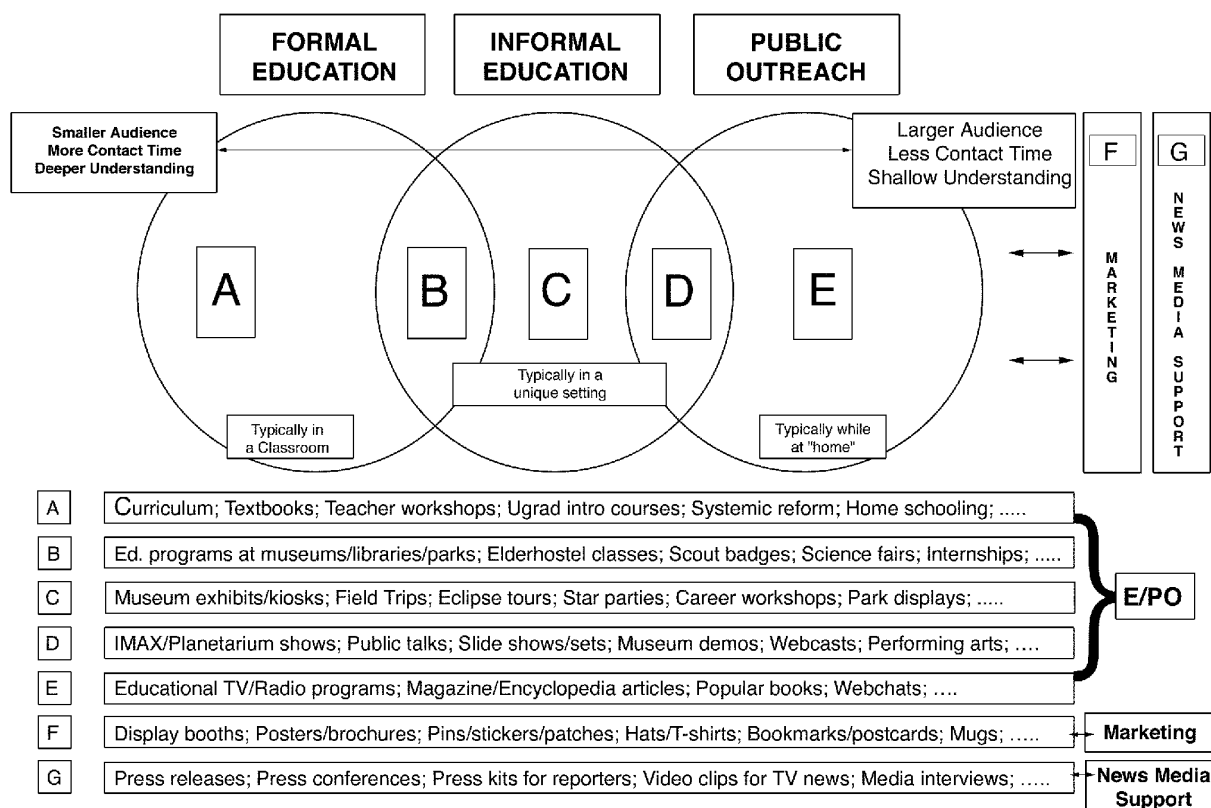
Appendix B

Operating Principles of the NASA OSS E/PO Support Network (Updated 15 March 2000)

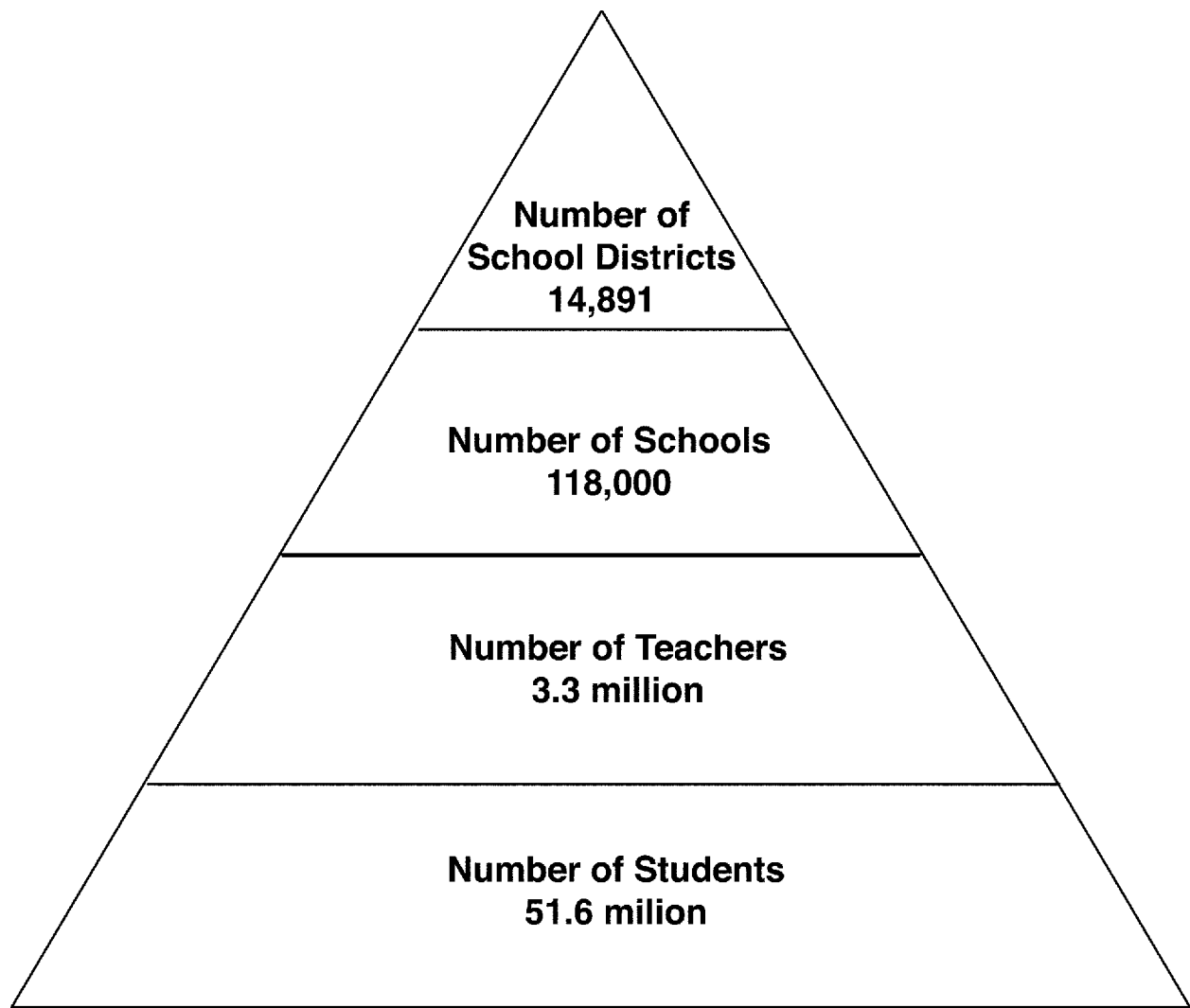
1. Education Forums and Broker/Facilitators will provide fair and equitable services to all customers of the OSS Education Support Network. Such services include: advice on proposal preparation; ideas on Education and Public Outreach (E/PO); and information on partnership opportunities with a wide variety of E/PO institutions and programs within and outside of NASA.
2. Forums or Broker/Facilitators, in their capacity as members of the Support Network, will not write E/PO segments of OSS AO or NRA proposals. In all cases, the responsibility for formulating the E/PO program and preparing a proposal is that of the proposer.
3. Forums and Broker/Facilitators will treat E/PO proposals prepared by support Network customers - who respond to NASA OSS AOs and NRAs - as proprietary information.
4. Forum and Broker/Facilitators are, in some cases, embedded in larger host organizations that have ongoing E/PO programs. To ensure fair and equitable services, Support Network members and their host organizations will follow existing best and fair business practices and good faith measures used by NASA and the space science research community regarding pre-proposal information dissemination, proposal creation, peer review, and proposal selection.
5. Forums and Broker/Facilitators will provide information to Support Network customers about options for partnership that feature competing possibilities and capabilities other than those of their host organization.
6. Support Network personnel will not participate in the review of E/PO segments of OSS proposals for which they have directly rendered services, or in which they or their host institutions are listed as partners.

Appendix C

Education and Public Outreach Venn Diagram* (Explained in [FAQ 11](#))



* A two page white paper entitled, "A Framework for Planning Education and Public Outreach Programs Associated with Scientific Research Programs" offers a more complete description of this diagram. It is available online from <http://www.spacescience.org/>. Use the "Quick Links" to "Papers on E/PO". C.A. Morrow, 2000.



Appendix D
Statistics on the US Education System

Adapted from "Implementing the Office of Space Science Education/Public Outreach Strategy"
(Updated 2000)

For a more specific breakdown (e.g., private vs. public schools) visit the Center for Education Reform's "Education Statistics At-a-Glance Web site at <http://edreform.com/pubs/edstats.htm>

Appendix E: A SAMPLE of ROLES for SCIENTISTS in EDUCATION and PUBLIC OUTREACH (E/PO)

		<i>Nature of E/PO Involvement</i>		
E n t r y P o i n t		ADVOCATE	RESOURCE	PARTNER
	K-12 STUDENTS	<ul style="list-style-type: none"> • Participate in PTA 	<ul style="list-style-type: none"> • Judge a science fair • Answer student E-mail • Give tour of a research facility 	<ul style="list-style-type: none"> • Mentor a student • Tutor a student
	IN-SERVICE K-12 TEACHERS	<ul style="list-style-type: none"> • Speak out in support of appropriate professional development opportunities for teachers. 	<ul style="list-style-type: none"> • Answer teacher email • Present in teacher workshop 	<ul style="list-style-type: none"> • Work with a teacher to implement curriculum. • Hire a teacher intern.
	INTRO UNDERGRADUATE SCIENCE TEACHING	<ul style="list-style-type: none"> • Speak out in a faculty meeting in favor of attention to educational research that supports the reform of undergraduate science teaching. • Support the teaching profession in your science classroom. 	<ul style="list-style-type: none"> • Teach a segment of a science or science methods course for preservice teachers. 	<ul style="list-style-type: none"> • Teach an intro science course that applies innovative inquiry-based methods • Develop a science course or curriculum in your department for teachers-to-be.
	SCHOOLS OF EDUCATION (Science Courses for Preservice Teachers, Graduate Students, Faculty Members)	<ul style="list-style-type: none"> • Speak out in your department or organization in favor of closer ties with Colleges of Education • Support the teaching profession in your classroom 	<ul style="list-style-type: none"> • Teach a segment of a science course or science methods course for preservice teachers. • Collaborate with education faculty to improve courses on teaching science 	<ul style="list-style-type: none"> • Hire a graduate in education as evaluator of an education project • Work with an Education professor to develop a new “science methods” course for teachers-to-be.
	SYSTEMIC CHANGE (District, State, National)	<ul style="list-style-type: none"> • Speak out at professional meetings about the importance and value of scientist involvement in systemic change. 	<ul style="list-style-type: none"> • Review science standards for science accuracy. 	<ul style="list-style-type: none"> • Collaborate on writing or adapting science standards.
	EDUCATION MATERIALS DEV. (NSRC, EDC, Lawrence Hall)	<ul style="list-style-type: none"> • Speak out at a school board meeting for adopting exemplary educational materials. 	<ul style="list-style-type: none"> • Review science educational materials for science accuracy. 	<ul style="list-style-type: none"> • Collaborate to create exemplary science education materials.
	INFORMAL EDUCATION (e.g., Science Centers, Scouts, After-school Programs, Planetaria, Elderhostels, Amateur Astronomy Groups)	<ul style="list-style-type: none"> • Participate on the board of a science center or planetarium. 	<ul style="list-style-type: none"> • Review scripts for science exhibit or planetarium show. • Serve as a science advisor for an exhibit or program. 	<ul style="list-style-type: none"> • Create content for a museum science exhibit or planetarium show. • Serve as science coordinator for a scout troop
	PUBLIC OUTREACH (e.g., NPR, PBS, popular magazines/ books/ encyclopedias, lecture circuits, public Web sites)	<ul style="list-style-type: none"> • Advocate that quality science news be covered by your local newspapers and television stations 	<ul style="list-style-type: none"> • Give a public lecture • Review an article or web site on science for accuracy and currency 	<ul style="list-style-type: none"> • Collaborate in the production of a PBS television show • Write an article for a popular science magazine
	E/PO PROGRAM MANAGEMENT	<ul style="list-style-type: none"> • Advocate the involvement of scientists in education and public outreach 	<ul style="list-style-type: none"> • Assist a scientist with matching their talents and interests to an E/PO project 	<ul style="list-style-type: none"> • Design E/PO programs with effective partnerships between scientists and educators.

See discussion on next page.

The far left column constitutes various entry points into the E/PO realm. The subsequent columns represent the nature of the E/PO involvement. An **advocate** inspires, encourages, gives permission, and generally empowers others in their E/PO efforts; a **resource** helps when called upon, and generally makes resources and facilities available to others in support of their E/PO efforts, and a **partner** works “shoulder-to-shoulder” with E/PO specialists to create new products or opportunities.

For a more detailed description of this matrix, please see the white paper “The Diversity of Roles for Scientists in Education and Public Outreach,” at <http://www.spacescience.org/Education/ResourcesForScientists/Workshops/Four-Day/Resources/Articles/>.
C.A. Morrow, 2000.

An evolving on-line matrix of profiles describing the roles of actual scientists involved in Education and Public Outreach can be found at <http://ssibroker.colorado.edu/Rolesmatrix/>

Appendix F

Links to Science, Math and Technology Education Standards

Academic content standards describe what every student should know and be able to do in the core academic content areas (e.g., mathematics, science, geography). Content standards should apply equally to students of all races and ethnicities, from all linguistic and cultural backgrounds, both with and without special learning needs.

Science Standards

NRC National Science Education Standards

<http://www.nap.edu/books/0309053269/html/index.html>)

Describes the science standards created by the National Research Council.

AAAS Project 2061 Benchmarks

[\(http://project2061.aaas.org/tools/\)](http://project2061.aaas.org/tools/)

Describes the science standards created by the American Association for the Advancement of Science.

Mathematics Standards

<http://standards.nctm.org/>

Describes the mathematics standards created by the National Council of Teachers of Mathematics.

Technology Standards

<http://cnets.iste.org/>

Describes the technology standards created by the International Society for Technology in Education.

State Standards

<http://www.statestandards.com>

Appendix G

NSF-Supported Systemic Initiatives

<http://www.ehr.nsf.gov/ehr/esr/>

Systemic refers to fundamental, comprehensive, and coordinated changes in science, mathematics, and technology education through attendant changes in policy, resource allocation, governance, management, content, and conduct. There are currently two types of NSF-supported Systemic Initiatives: Urban Systemic Initiatives (USI) and Rural Systemic Initiatives (RSI). Although there will be no further competitions in any of these programs until further notice, the establishment of partnerships with organizations in regions supported by these initiatives is encouraged.

URBAN SYSTEMIC INITIATIVES (USI)

<http://www.ehr.nsf.gov/esr/programs/usp/>

NSF established the Urban Systemic Initiatives (USI) in Science, Mathematics, and Technology Education to effect sustained school reform in its urban centers that enroll nearly half of public school students in the nation. Through this initiative, the Foundation invites the 28 cities with the largest enrollment of K-12 students below the poverty level to launch systemic programs.

RURAL SYSTEMIC INITIATIVES (RSI)

<http://www.ehr.nsf.gov/esr/programs/rsi/>

The Rural Systemic Initiatives (RSI) in Science, Mathematics, and Technology Education Program stimulates systemic educational reform of science, mathematics and technology education in rural, economically disadvantaged regions. The Rural Systemic Initiatives program funds regions that have no incorporated towns larger than 20,000 in population, and in which 30% or more of the school-age children live at or below the poverty level.

Appendix H

Links to Organizations Serving Underserved/Underutilized Populations

NASA Minority University Research and Education Programs

<http://mured.nasaprs.com/>

American Indian Higher Education Consortium (AIHEC)

<http://www.aihec.org/>

Women and Minorities in Science and Engineering

http://www.mills.edu/ACAD_INFO/MCS/SPERTUS/Gender/wom_and_min.html

National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE)

<http://www.nobccche.org>

National Society of Hispanic Physicists (NSHP)

<http://physics.utep.edu/physics/nshp/nshp.html>

National Institutes of Health Black Scientists Association (NIH BSA)

<http://bsa.od.nih.gov>

National Association for Black Geologists and Geophysicists (NABGG)

<http://www.nabgg.org>

Council for African-American Researchers in the Mathematical Sciences (CAARMS)

<http://cm.bell-labs.com/who/will/caarms7.html>

National Association of Mathematicians (NAM)

<http://www.math.buffalo.edu/mad/NAM>

National Society of Black Physicists (NSBP)

<http://www.nsbp.org>

Society for the Advancement of Chicanos and Native Americans in Science (SACNAS)

<http://www.sacnas.org>

The Institute for African-American E-Culture

<http://www.iaaec.com>

Coalition to Diversify Computing (CDC)

<http://www.npaci.edu/Outreach/CDC>

American Indian Science and Engineering Society (AISES)

<http://www.aises.org>

Appendix I

Sample E/PO Program Manager

The E/PO manager will be responsible for the overall planning, management and coordination of all formal and informal education activities.

Position duties and requirements:

1. In collaboration with the science and technology team members design and develop a suite of formal education materials/products and resources aligned with the Mission science objectives. (15%)
2. Alignment and coordination of formal and informal education activities. Develop and coordinate a series of informal education activities, products and events aligned with key Mission milestones. (15%)
3. Assume overall responsibility for the management and reporting of the Mission E/PO budget expenditures and assume all NASA HQ reporting requirements. Develop an end-to end schedule of activities, events and deliverables appropriately aligned with the Mission E/PO budget. (10%)
4. Insure all partner institutions/organizations, and co-investigators (museums, universities, and all other sub-contracting organizations) are compliant with NASA Guidelines and have formal institutional authorization for participation. Insure adherence to OSS E/PO policies and guidelines as they pertain to various partner/collaborative organizations as well as all other general legal requirements for federally funded research activities. (5%)
5. Function as representative for the Mission E/PO Program at appropriate professional society meetings and various NASA education events. (5%)
6. Responsible for insuring all educational products developed for the Mission E/PO program (including curricular materials, and all on-line activities and products) align with Mission science objectives as well as appropriate national education standards, are independently evaluated and are made available to the education community in accordance with NASA OSS policies and requirements. (15%)
7. Coordinate participation of Mission Scientific and technical team members for various Mission Public Events. (15%)
8. Participate in other programs, and activities such as workshops, events, and Public Presentations as required. Various other duties relevant to Mission E/PO effort as required. (20%)

Educational Requirements, Skills and Experience:

1. Understanding of OSS Education and Public Outreach and the current Exploration Programmatic goals.
2. Terminal degree in relevant area of scientific expertise or in science, mathematics, or technology education with a minimum of five years of relevant experience leading large, preferably national scale education programs that focus on content relevant to NASA Office of Space Science content areas. A minimum of 10 years of relevant experience in a Formal Science/Mathematic/Technological Education setting with increasing duties that demonstrate successful progression into a leadership/managerial role may be considered in lieu of a terminal degree.
3. Candidates without terminal degree in science/math/technology must demonstrate experience and understanding of relevant science, math, and technical content areas and ability to communicate and work effectively with scientific and technical staff.
4. Candidates without significant K-12 educational expertise must demonstrate experience and ability to interact effectively with formal/informal education community and address current National Science, Mathematics and Technology Education requirements.
5. Significant experience working effectively with underserved communities and awareness of the unique educational needs of these communities.
6. Excellent oral and written communication skills and formal presentation skills. Ability to work effectively as a team member and diverse national audiences with a wide range experience, interests and abilities.
7. Flexibility and ability to adapt and function effectively in a fast-paced working environment.

Appendix J

Sample E/PO Evaluation Form

NASA OFFICE OF SPACE SCIENCE EDUCATION AND PUBLIC OUTREACH PROGRAM

E/PO Proposal Evaluation Form NNH04ZSS001N (ROSS'04 Proposals)

Proposal Number:	PI Name:	Version:
Proposal Title:		
Submitting Organization/Institution:		
Reviewers Name Printed:		
Reviewer Signature:		

CRITERIA:	EXCELLENT	VERY GOOD	GOOD	FAIR	POOR
1. Intrinsic Merit - Quality, Scope, Realism, and Appropriateness - Customer Needs Focus - Partnerships/Leverage/Sustainability - Evaluation					
2. Relevance to NASA - Content - Pipeline - Diversity					
3. Cost - Resource Utilization					

RECOMMENDATION:

Recommend for Funding	
Acceptable for Funding	
Do Not Fund	

Brief Summary of Proposed Project:

Strengths:

Weaknesses:

Overall Comments: